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HOLDING DEVICE FOR FASTENING AN ELECTRONIC COMPONENT

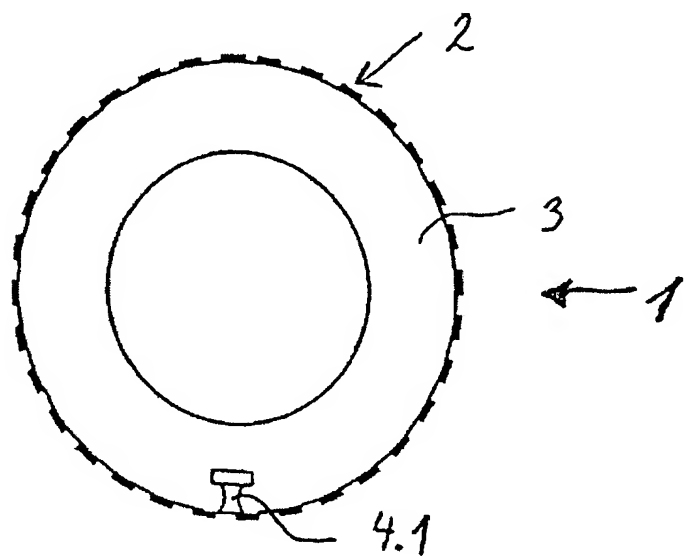
Inventors:	Anton Mangold 82467 Garmisch-Patentkirchen Josef Schorer 82438 Eschenlohe (DE)
Applicant:	IQ Mobil Electronics GmbH 82515 Wolfratshausen (DE)
Agents:	Friedrich Lang and Dr. Isabel Tomerius, Patent Attorneys, 80336 Munich

The following information was taken from documents [as] submitted by the applicant.

Summary

The invention concerns a holding device for fastening an electric component in a wheel. The holding device has at least one device carrier to receive and hold electronic components and at least one damping foot, which is elastic in at least certain areas and is connected in a permanently elastic manner to the tire casing. The damping foot has a damping effect and is designed to be elastic and tapered along its longitudinal axis. The fastening of the damping foot to the device carrier and the tire casing can be undertaken, for example, by adhesion or vulcanizing. In other models, the damping foot is also produced with the device carrier and the tire casing in one

piece from the tire material. Advantageously, the damping foot also conducts energy and heat and comprises a capacitive or inductive coupling to connect two electronic components or an antenna.



[0001]

The invention concerns a holding device for fastening an electronic component in a wheel, comprising a tire. Such holding devices are used to fasten, for example, sensors that monitor, for example, the tire pressure, tire temperature, or profile depth of, for example, automobile or aircraft tires, or also transponders, which will then transfer characteristic data to an on board computer for further evaluation. Holding devices which fasten the corresponding electronic components within the wheel on the tire valve or on the rim are known.

[0002]

However these known holding devices used to fasten electronic components have the disadvantage that they do not enable the free selection of the fastening site of the electronic components. Nor can these known holding devices enable the electronic component to be directly fastened on the tire casing. Thus, it is not possible to record measurement variables, such as tire temperature, via a sensor at the site which is most stressed, such as, here, the tread, directly where such variables occur. This inevitably leads to false measurement results.

[0003]

Furthermore, such held electronic components must be fastened, for example, on the rim, in an additional installation step. This lead to additional installation costs and additional possible

sources of error in the fastening of the electronic component on the wheel. However, defective or incorrectly installed holding devices used, for example, to fasten a sensor on the valve within the interior tire space, are a great danger. Loosening of the electronic component as a result of defective fastening leads, as a rule, to the bursting of the tire. Leaking of the valves or seals between the valve and the tire may occur as a result of fastening these relatively heavy components to the valves.

[0004]

Another disadvantage of the known holding devices is that a clear assignment of tire-specific variables is not possible.

Problem statement

[0005]

Therefore, the invention is based on the problem of devising a holding device to fasten an electronic component in a wheel that makes possible a more exact recording of measurement values on the tire.

[0006]

In accordance with the invention, this problem is solved in that the holding device to fasten an electronic component in a wheel comprising a tire casing has at least one device carrier to receive and hold the electronic component and at least one damping foot, which is elastic at least in certain areas and is connected to the tire casing in a permanently elastic manner.

[0007]

The permanently elastic connection of the holding device with the tire casing makes possible an almost freely selectable fastening position on the tire casing. "Permanently elastic" is understood to mean a connection which makes possible a continuously safe, elastic, pliable connection over the period of use of the tire, even under the effect of strong vibrations and temperature fluctuations.

[0008]

"Tire casing" is understood to mean, here, the tire parts that enclose the interior space of the tire in the broadest sense. The fastening can take place both on the tread and on the sidewall of the tire. The fastening can be directly on the inside surface of the tire casing or in another inside layer of the tire material, for example, the inside liner, a butyl layer that counteracts the diffusion of air through the tire.

[0009]

The device carrier is used to take up and fasten the electronic components in the holding device. Thus, the device carrier can be, for example, a bowl-shaped or U-shaped component in which the electronic components are placed and then fastened. A plate on which the electronic components can be fastened would also be conceivable.

[0010]

The damping foot is used for mechanically decoupling the device carrier and the electric components found therein from the movements, deformations, and vibrations of the tire casing. In this way, they are transferred to the device carrier only in absorbed or damped form. This leads to a clear reduction of the mechanical stress an the electronic components, increasing, among other things, their operational reliability, and thus makes possible, for the first time, the fastening of the holding device in the areas of the tires which are stressed with particular intensity, for example, by flexing processes. In this way, sensors or transponders, for example, can also be placed in tires with emergency running properties. A running direction dependence could also be avoided by placing the holding device in the middle, directly under the tire tread.

[0011]

The damping foot can be designed to be elastic in certain areas, for example, as a rigid metal or plastic tube with a spring or a damping element, or it can be entirely elastic, for example, a tube made of elastic, rubber, or elastic plastic. The damping foot can have the shape of, among other things, a mushroom, square, rectangular parallelepiped, prism, cone, or cylinder.

[0012]

By the fastening of, for example, characteristic variables-storing or rewritable electronic components on a tire, which is permanently secured in this manner and which can be undertaken during the production of the tire, an individualization of the tire is possible. Thus, safety-relevant information regarding the tire can be entered into the electronic component, for example, an RFID transponder. Among such characteristic values are, for example, the loading and speed indices, the tire type, and the manufacturing date, and the serial number of the tire. The re-writability is of particular interest in, among other things, the reconditioning of tires. In this way, it is possible to record, for example, the load history of the tire, which in turn permits, as a load diagram, conclusions to be drawn regarding the state of the tire.

[0013]

An advantageous refinement of the holding device provides for the damping foot to be made of the same elastic material as the tire casing. This ensures that there will not be different expansions due to temperature and corresponding forced stresses between the holder and tire, which will negatively influence the durability of the permanently elastic connection.

[0014]

Another refinement of the holding device involves the at least partial hollow construction of the damping foot. Thus, for example, it can be hose-like or have weight-reducing and damping-reinforcing hollow spaces, chambers, or honeycombs. Also, an embodiment which is hollow throughout is conceivable.

[0015]

In order to make possible the temperature measurement by a sensor found in the device carrier, in one embodiment, the damping foot can comprise at least in certain areas, a heat-conducting material. Thus, for example, the cavity of the hose-like damping foot could be filled with such a heat-conducting composition. It is also expedient to construct the entire damping foot from a material which conducts heat well or to produce the damping foot from a composite material, which contains, for example, copper wires or copper particles or other heat-conducting materials.

[0016]

In order to make power transfer by the damping foot possible, it is also advantageous that the foot comprise, at least in certain areas, a current-conducting material. However, it is also expedient that the entire damping foot be constructed of a material which conducts current well or to produce the damping foot from a composite material that contains, for example, copper wires or copper particles or other current-conducting materials.

[0017]

In another advantageous refinement, the damping foot comprises an antenna. It could be integrated with the damping foot material or be arranged in the hollow space of the damping foot.

[0018]

Advantageously, the damping foot is constructed so that at least in certain areas it tapers in its transverse expansion. Such a tapering in certain areas can be, for example, a notch. This

tapering leads to a reinforced mechanical decoupling of the device carrier from the tire casing and its movements.

[0019]

Another refinement of the invention consists in forming a cohesively produced monolithic unit from the tire casing and the damping foot. This means that the damping foot is produced from the same material as the tire and is integral therewith. The damping foot would therefore, in this case, be a type of inward elevation of the tire casing.

[0020]

In another embodiment, the holding device can be adhered to the tire casing. This can take place, for example, via gluing with an adhesive or via a cold or hot vulcanization process. In this way, an additional equipping of the holding device on the tire, in accordance with the invention, would be possible.

[0021]

Advantageously, the device carrier is made of metal, for example, aluminum or steel. An embodiment in which the device carrier is made of a plastic, such as PVC, is also conceivable and is likewise advantageous.

[0022]

The fastening of the device carrier on the damping foot can be effected by adhesion or vulcanization. In another embodiment, the device carrier is attached to the damping foot. This is understood to mean a flexible connection, via clips or spring-loaded latches. In this way, it is possible to make subsequent changes to the electronic component or the device carrier since the device carrier is then attachable and detachable. This permits, for example, the manufacture of tires in large numbers, that are already provided with a damping foot. Such tires would be only slightly more expensive to produce, but would permit, depending on the customer's wishes, for example, a subsequent equipping of the tire with an electronic component. In this way, the possibility of replacing defective electronic components without having to replace the entire tire would also be possible. Also, this would lower the logistic expenditure in the production of the tire.

[0023]

In another refinement, the damping foot and the device carrier form a cohesively produced monolithic unit. This means that the device carrier is produced from the same material as the

damping foot and is integral therewith. The carrier device would therefore, in this case, be a type of widening, for example, with a holding surface or bulge of the damping foot.

[0024]

Another embodiment of the holding device provides for the fastening of the device carrier, via at least one transverse carrier, with at least one damping foot, on the tire casing. In this way it is possible not to place the device carrier directly over but rather, for example, also laterally from the center of gravity of the damping foot and thus to increase, among other things, the mechanical decoupling of the holding device. Also, it may be advantageous to fasten several electronic components at intervals but nevertheless with one holding device on the tire, where a larger device carrier is fastened on this transverse carrier and would be influenced by several damping feet. Also, a bridge-like embodiment in which the transverse carrier connects at least two damping feet and in which the device carrier sits on the transverse carrier is advantageous. Such a transverse carrier could be made, for example, from a plastic or metal rail or also from the same material as the damping foot.

[0025]

Preferably, the electronic components to be held are firmly connected to the device carrier. This can also take place by adhesion or vulcanizing into the device carrier.

[0026]

In another embodiment, a capacitive or inductive coupling is provided in the damping foot to connect two electronic components. In this way, it is possible to combine the advantages of the patent application of the inductive or capacitive coupling to connect two electronic components, submitted in parallel by the inventor, and those of the invention under consideration.

Embodiment example

[0027]

The invention is explained further, below, with the aid of embodiment examples shown in the drawing. Shown schematically are:

[0028]

Figure 1, a section through a tire, in which a holding device is placed to fasten electronic components on the tread;

[0029]

Figure 2, an enlarged cross-sectional representation of the holding device shown in Figure 1.

[0030]

Figure 3, a side view of the holding device through A-A in Figure 2.

[0031]

Figure 4, a top view of the holding device shown in Figures 1, 2, 3.

[0032]

Figure 5, a section through a tire in which a holding device for the fastening of electronic components is placed on the sidewall of the tire and in which the device carrier is fastened laterally on a transverse carrier;

[0033]

Figure 6, an enlarged cross-sectional representation of the holding device shown in Figure 5;

[0034]

Figure 7, a side view of the holding device through B-B in Figure 6;

[0035]

Figure 8, a top view of the holding device shown in Figures 5, 6, 7;

[0036]

Figure 9, a section through a tire, in which a holding device for the fastening of electronic components is placed on the sidewall of the tire and in which the device carrier is held laterally by two transverse carriers, acted on by damping feet.

[0037]

Figure 10, a side view of the holding device shown in Figure 4;

[0038]

Figure 11, a top view of the holding device shown in Figure 10; and

[0039]

Figure 12, the section C-C through the holding device shown in Figures 9, 10, 11; the same parts are provided with the same reference symbols in the figures.

[0040]

Individually, Figure 1 shows a section through a tire 1, which has a sidewall 3 and a tread 2. A first embodiment example 4.1 of a holding device for the fastening of electronic components, such as sensors, transponders, or storage media, is placed on the inside of the tread 2 in the tire 1.

[0041]

As shown in Figure 2 and Figure 3, the holding device 4.1 shown in Figure 1 comprises an individual damping foot 7 and a device carrier 5. An electronic component 6 is fastened on the device carrier 5. In this embodiment example, the damping foot 7 is a component which has a rotationally symmetrical form and tapers along its longitudinal axis 9. The damping foot 7 in this embodiment example is connected in a permanently elastic manner to the tread 2 and the device carrier 5. The device carrier 5 is U-shaped in this embodiment and can be made, for example, of a metal or a plastic material.

[0042]

Figure 4 shows a top view of the holding device 4.1 shown in Figure 2 and Figure 3. In this first embodiment example, the damping foot 7 has a circularly cylindrical cross section. The thickness of the damping foot 7 is greatest in the area where it is fastened to the tread, and least in its central area; it again increases toward the area where the device carrier 5 is fastened. By means of this design, the connecting surface of the damping foot in the area were it is fastened to the tire casing (here, the inside of the tread 2 and the device carrier 5) is as large as possible. In this way, a connecting force is obtained between the damping foot 7 and the tire 1 or the device carrier 5 that is as large as possible. The tapering in the middle area produces in turn a particularly good mechanical decoupling of the vibrations and movements of the tire 1.

[0043]

Figure 5 shows a section through a tire 1, in which a holding device for the fastening of electronic components according to a second embodiment example is shown. Here, the holding device 4.2 is placed on the sidewall 3 of the tire 1.

[0044]

Figure 6 shows an enlarged cross-sectional representation of the holding device 4.2 shown in Figure 5. An electronic component 6 is inserted into the device carrier 5 from below. The damping foot 7 has a broadened fastening surface in the area of the tire sidewall 3 and tapers toward the transverse carrier 8, as can be seen in Figure 7. The device carrier 5 is thus fastened laterally on the transverse carrier 8. The transverse carrier 8 is fastened in turn in a permanently elastic manner to the damping foot 7. The connection between the damping foot 7 and the tire wall 3 is also permanently elastic. The electronic component 6 in this embodiment example is fastened on the side of the device carrier 5 that faces the tire wall 3.

[0045]

Figure 9 shows a section through a tire 1. Here, a holding device is shown, according to a third embodiment example, for the fastening of electronic components in a tire 1. As can also be seen in Figure 10, the device carrier 5 is held here by two laterally placed transverse carriers 8. A damping foot 7 is fastened on the two lateral ends of the transverse carrier 8. The damping feet 7 in turn, are connected, in a permanently elastic manner to the tire sidewall 3. As can be seen clearly from Figures 11 and 12, various electronic components 6 are fastened in the device carrier 5.

Claims

1. Holding device for the fastening of an electronic component in a wheel, which comprises a tire casing, characterized in that the holding device comprises at least one device carrier to receive and hold the electronic component and at least one damping foot, which is connected in a permanently elastic manner to the tire casing and is elastic at least in certain areas.

2. Holding device according to Claim 1, characterized in that the damping foot is made of the same elastic materials as the tire casing.

3. Holding device according to Claims 1 or 2, characterized in that the damping foot is at least partially hollow.

4. Holding device according to one of the preceding claims, characterized in that the damping foot comprises a heat-conducting material, at least in certain areas.

5. Holding device according to one of the preceding claims, characterized in that the damping foot comprises a current-conducting material, at least in certain areas.

6. Holding device according to one of the preceding claims, characterized in that the damping foot comprises an antenna.

7. Holding device according to one of the preceding claims, characterized in that in its transverse extension, the damping foot is designed in a tapering manner, at least in certain areas.

8. Holding device according to one of the preceding claims, characterized in that the tire casing and the damping foot form a cohesively produced monolithic unit.

9. Holding device according to one of Claims 1 to 7, characterized in that the holding device is adhered to the tire casing.

10. Holding device according to one of Claims 1 to 7, characterized in that the holding device is vulcanized on the tire casing.

11. Holding device according to one of the preceding claims, characterized in that the device carrier is made of a metal.

12. Holding device according to one of Claims 1 to 10, characterized in that the device carrier is made of a plastic.

13. Holding device according to one of the preceding claims, characterized in that the device carrier is adhered to the damping foot.

14. Holding device according to one of the preceding claims, characterized in that the device carrier is vulcanized to the damping foot.

15. Holding device according to one of Claims 1 to 12, characterized in that the device carrier is fastened to the damping foot.

16. Holding device according to one of Claims 1 to 12, characterized in that the damping foot and the device carrier form a cohesively produced monolithic unit.

17. Holding device according to one of the preceding claims, characterized in that the device carrier is fastened to the tire casing, with at least one damping foot, via at least one transverse carrier.

18. Holding device according to one of the preceding claims, characterized in that the electronic components to be held are firmly connected to the device carrier.

19. Holding device according to one of the preceding claims, characterized in that in the damping foot, a capacitive or inductive coupling is provided to connect two electronic components.

Appended drawings

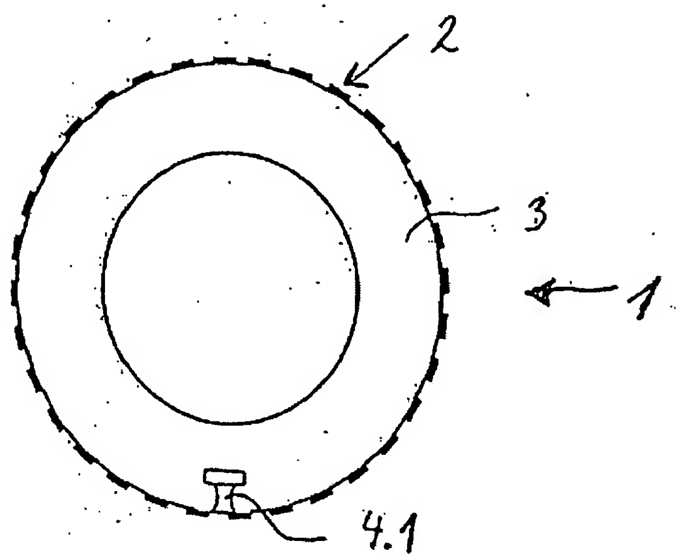


Figure 1

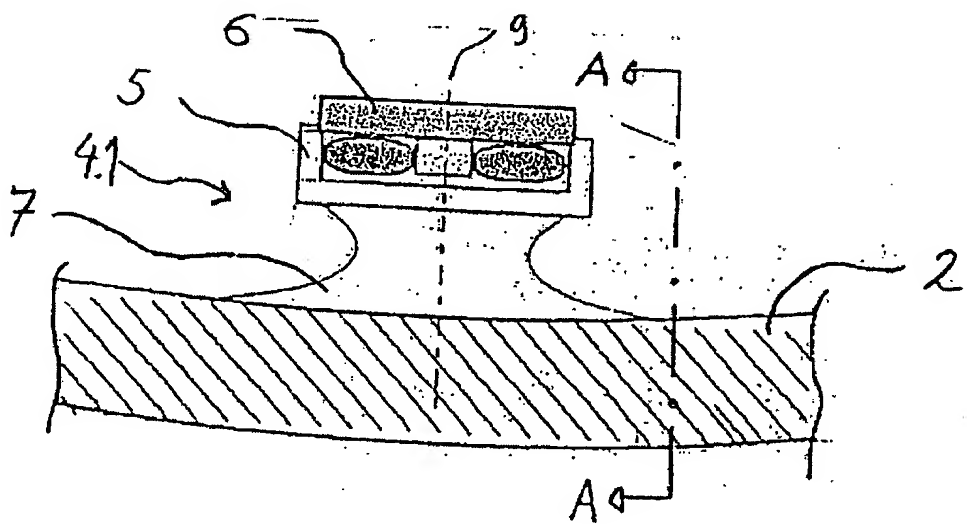


Figure 2

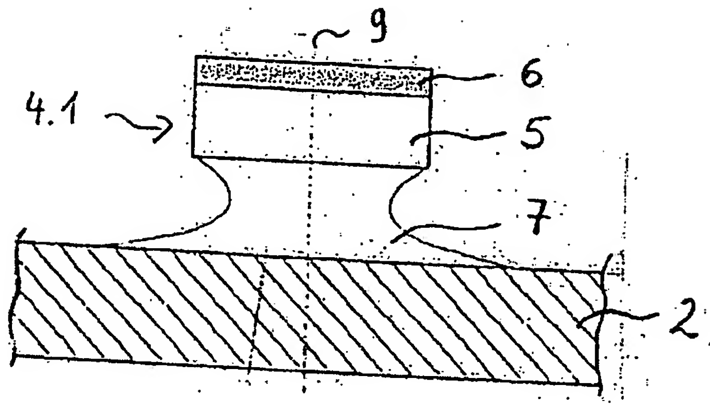


Figure 3

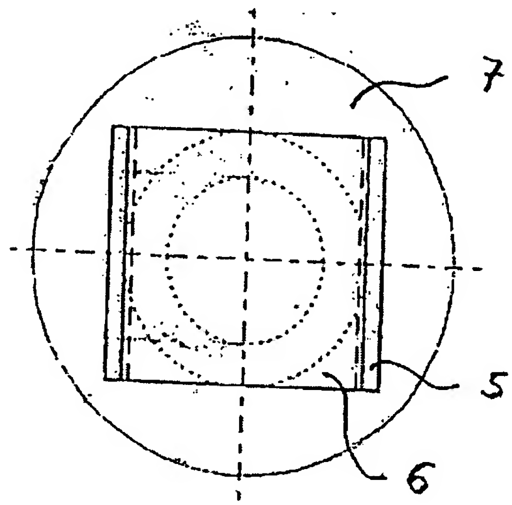


Figure 4

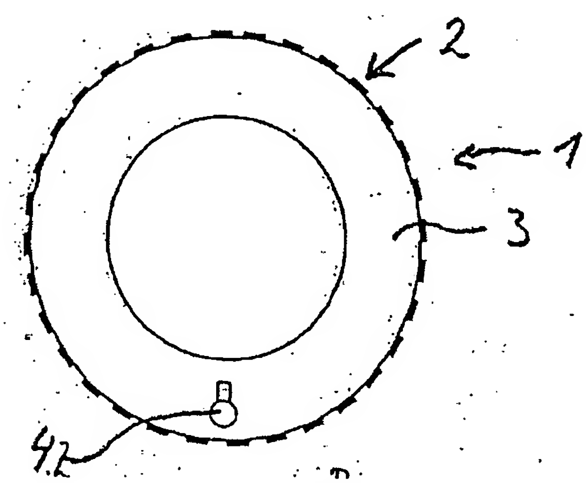


Figure 5

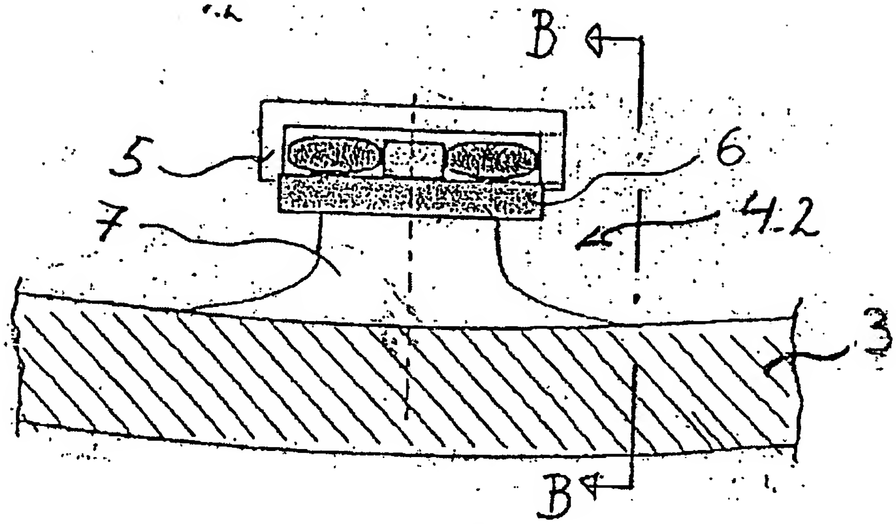


Figure 6

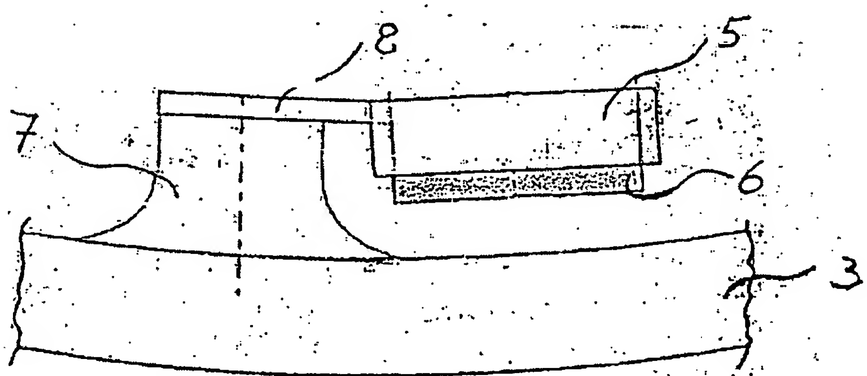


Figure 7

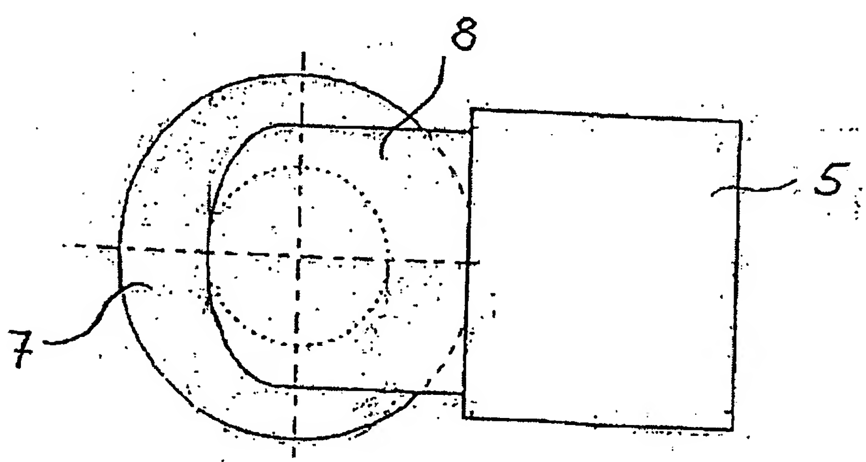


Figure 8

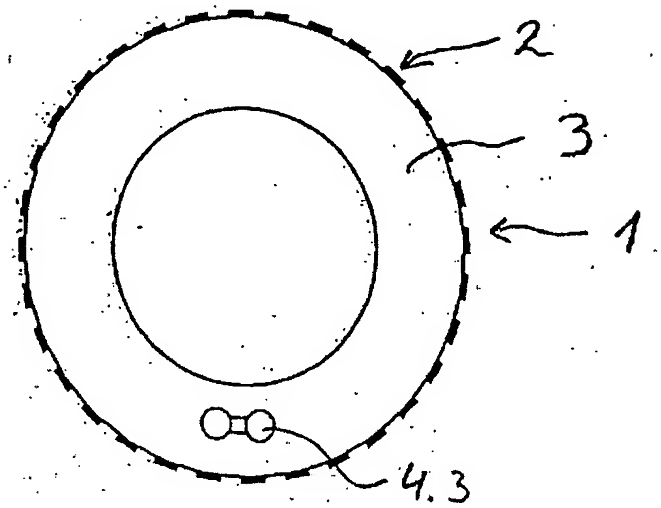


Figure 9

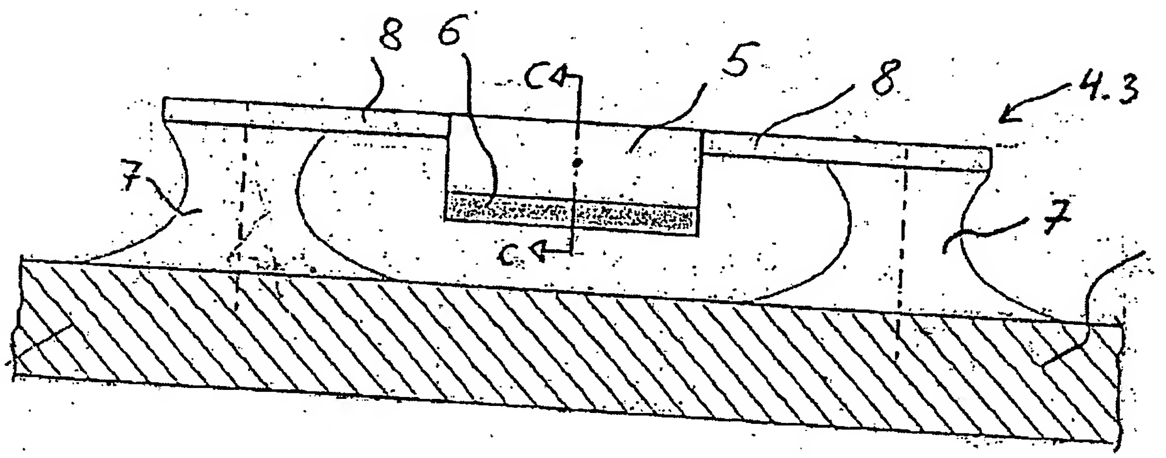


Figure 10

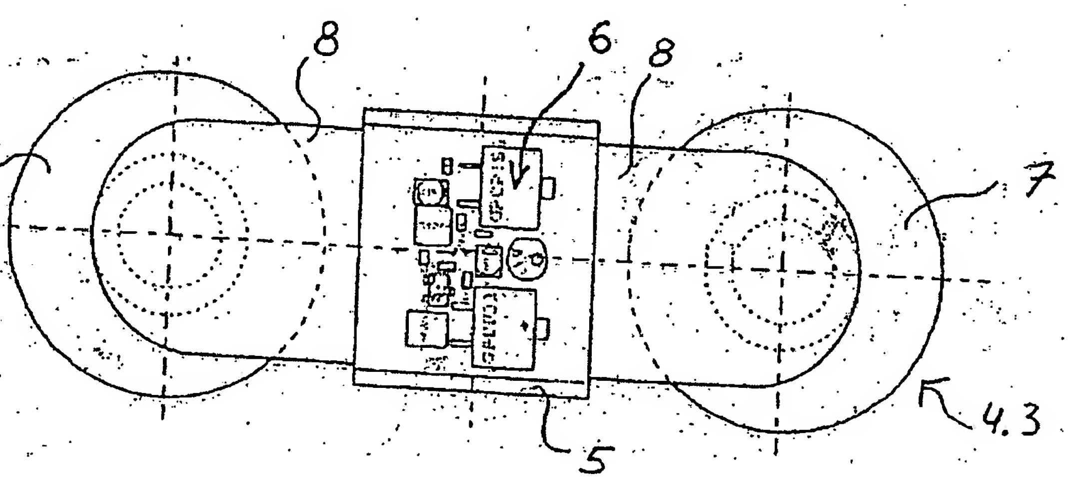


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Figure 11

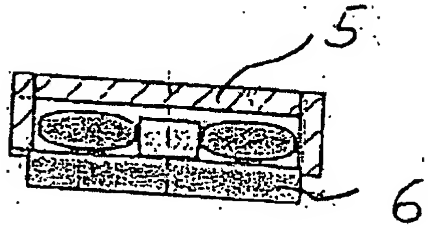

Figure 12